

# **TCEQ Interoffice Memorandum**

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**To:** Danielle Sattman Soule, Project Manager, Superfund Section, Remediation Division

**From:** Vickie Reat, Technical Support Section, Remediation Division

**Date:** December 3, 2010

**Subject:** Draft Baseline Ecological Risk Assessment (BERA) Work Plan  
Patrick Bayou Superfund Site  
Prepared by Anchor QEA, LLC  
September 2010, and

Attachment 1

Draft Fish and Invertebrate Tissue Sampling and Analysis Plan  
Patrick Bayou Superfund Site  
Prepared by Anchor QEA, LLC  
June 2010

Per your request, I have reviewed the subject documents. My comments are outlined in this memo. I also received verbal input from Dr. Linda Broach of the TCEQ Houston Region office, in the preparation of these comments.

## Comments on the Draft Baseline Ecological Risk Assessment Work Plan General Comments

1. The Joint Defense Group (JDG) should provide a general explanation of the sampling reaches and the designation of a sample from any one reach. Spatially, how will tissue data be related to a wildlife receptor?
2. The JDG should provide an overall summary/comparison of what receptors/pathways and chemicals of potential concern (COPCs) were "dropped" based on the analyses in this document. We suggest a table(s) that summarizes the decisions herein compared with those detailed in Selection of Contaminants of Potential Concern for Ecological Risk Assessment (Anchor 2008a) and Selection of Contaminants of Potential Concern for Ecological Risk Assessment Amendment (Anchor 2008b).
3. To evaluate risks to benthos in Patrick Bayou, toxicity test results are needed on multiple species and endpoints. Looking at the historical toxicity test data, the limited toxicity results for the sediment samples tested with other species suggests that some of the other test organisms were sensitive to Patrick Bayou sediments whereas *Leptocheirus* survival was not significantly affected. We suggest additional toxicity data using another sensitive species. This could be addressed by inclusion of additional historical toxicity test data for other species

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in the model development and/or use of supplemental current toxicity test data for model development. Without this, we feel that the existing data is not sensitive enough for development of the predictive model. Our concern is that the existing data may indicate that fairly elevated concentrations of COPCs in Patrick Bayou are not toxic to benthos, whereas this may very well be a question of sensitivity and test duration.

#### Specific Comments

4. 2.6.3.2 Bioaccumulative COPCs (Fish) - Although this information is captured elsewhere (2008 COPC report and Appendix A), a table should summarize the estimated fish tissue concentration, midpoint TRV, and hazard quotient (all in Table 9) along with the sediment concentration upper confidence limit (UCL), and biota-sediment accumulation factor (BSAF). We are assuming that the JDG used the same geometric mean BSAF values as provided in the 2008 COPC reports.
5. 2.7.1.1 Status of the Brown Pelican as a Species of Special Concern - TCEQ will defer to the Texas Parks and Wildlife Department on a decision whether the brown pelican is currently listed as a state threatened or endangered species. If it is, the risk calculations for the pelican, or an appropriate surrogate such as the cormorant, should be carried out using the no observed apparent effects level toxicity reference value (NOAEL TRV) only for each COPC.
6. 2.7.2.1 Refined Effects Assessment (Calculation of the Midpoint TRV) - Table 11 provides the midpoint wildlife TRVs for birds and for the remaining mammalian measurement receptor, the raccoon. For transparency sake, we suggest that this table also provide the NOAEL and LOAEL (lowest observed apparent effects level) TRVs previously provided in the COPC Report and Addendum. Additionally, the JDG should make it clear that the raccoon midpoint TRVs were based on the NOAEL and LOAEL values (not the tissue benchmark values) from Table C-5 of the COPC report, and that these values were body-weight scaled using the formula indicated in the footnote accompanying Table 10.
7. 2.7.2.1 Refined Effects Assessment (Calculation of the Midpoint TRV) - The midpoint TRV for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT for birds is indicated as 0.0154 whereas the value indicated in the calculations in Appendix A, is 1.25. We assume the correct value, averaging the NOAEL and LOAEL from Table 10, is 1.25.

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8. 2.7.2.2 Refined Exposure Assessment - The discussion indicates that the assimilation efficiency (AE) and gross energy (GE) terms in the total daily intake (TDI) equation for ingestion of biota were adjusted to reflect the average value reported in the literature. The AE and GE values in the Appendix A table titled, "Derivation of Gross Energy and Assimilation Efficiency Parameters," should be reconciled with the values/information in Table 28.
9. 2.7.2.3 COPC Identification - This section discusses the refined TDI estimates for the spotted sandpiper, carnivorous wading birds, belted kingfisher, and raccoon. More details regarding the calculations are presented in Appendix A.
  - a. Looking at the equations in Appendix A for the various receptors, it appeared that body weight could be entered in kg for some equations and in g for others. This is confusing. Please evaluate the equations and ensure that the units are correct throughout the TDI determinations.
  - b. For the sandpiper total daily intake calculation (Appendix A), it does not appear the total includes the incidental sediment ingestion component. This may have impacted the COPCs carried forward. Please evaluate and make any corrections that are appropriate.
10. 2.7.2.3 COPC Identification - The refined wildlife COPC hazard quotients are provided in Table 13. Depending on the decision regarding the status of the Brown Pelican as a state-listed protected species, this table may need to be revised to reflect the addition of the brown pelican (or a suitable surrogate) as a receptor with the hazard quotient calculation based on the NOAEL TRV for each COPC.
11. 3.1.4.4 Piscivorous Birds - We agree that the belted kingfisher is an appropriate choice to represent small piscivorous birds. As indicated already, if the brown pelican is determined to be a state-listed threatened or endangered species, another larger piscivorous bird (or the pelican) should also be evaluated in the BERA.
12. 3.2.3 Exposure Pathways - Exposure pathways were designated as: complete and significant, complete and uncertain, complete and minor, or incomplete (Figure 3). There seems to be a conflict as the carnivorous bird's exposure to sediment (from ingestion) was indicated as complete and significant. Yet the calculations presented in Appendix A assumed zero sediment ingestion. Additionally, we do not agree that carnivorous mammal exposure should be designated as incomplete. These mammals could forage within/around Patrick Bayou although the conditions are not optimum (as is discussed in great detail

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elsewhere). A complete and uncertain or complete and minor designation seems more appropriate.

13. 4.3.1.2 Calculation of SQG Quotients - Tables B-1, B-2, and B-3 would be easier to evaluate if the corresponding effects range median (ERM), probably effect concentration (PEC), or probable effect level (PEL) value was provided.
14. 4.3.1.3 Calculation of Equilibrium Sediment Benchmarks - The discussion indicates that for a subset of the Site sediment data, analytical results were not available for all 34 polycyclic aromatic hydrocarbons (PAHs) included in the equilibrium screening benchmark (ESB) model, and that a scaling factor of 1.849 was used (based on regressions performed on data having all 34 PAHs) to estimate the scaled equivalent to the 34 PAH Total PAH ESB TU (Equilibrium Screening Benchmark Toxic Unit). We assume this means that where the Total PAH ESB TU for a given sample was based on 16 PAHs, that this value was multiplied by 1.849 to estimate an equivalent ESB TU for all 34 PAHs. Please explain in more detail how this scaling factor was developed along with the confidence level assumed in the analysis.
15. 4.3.1.3 Calculation of Equilibrium Sediment Benchmarks - Table B-4 displays the Total non-ionic COPC (NOC) ESB TU and the Total PAH ESB TU for each sample event at each sample location. For transparency, there should be an additional appendix and/or tables that detail these calculations.
16. 4.3.2 Toxicity Data and 4.4 Predictive Model Evaluation – See general comment 3.
17. 4.4.2 Model Optimization and Calibration - This discussion is fairly dense and the details of the evaluation are relegated to various tables and figures. We suggest that the JDG determine if there are additional ways to improve the transparency of this evaluation, and particularly that associated with the adjustment of the mean quotient threshold and the effect on the model reliability (and percent false negatives and false positives).
18. 4.4.2 Model Optimization and Calibration - Because portions of the bayou may be impacted by differing COPCs and because the bottom substrate may vary throughout the length of Patrick Bayou, we suggest that the JDG determine if the model reliability (and percent false negatives and false positives) will be improved by dividing the bayou into separate reaches for model development.
19. 4.5 Risk Characterization - The discussion indicates that the most recent surface sediment chemistry data will be used to calculate the optimized mean PEL-Q

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(probable effect level quotient) value for each sediment sample location and locations that exceed the optimized mean PEL-Q threshold of 1.56 will be identified as having a high probability for adverse effects to benthic invertebrates. Looking at Figure 7, it appears that use of an optimized mean PEL-Q threshold between 1.45 and 1.63 will still achieve the acceptability criteria outlined in Section 4.4.1 (page 53). We suggest that the JDG consider this wider range of PEL-Q thresholds for the analysis in the future risk assessment.

20. 4.6 Model Uncertainty Analysis – The uncertainty discussion should acknowledge that community structure information is lacking. Site benthos may be more or less sensitive to Patrick Bayou COPCs than the test organisms used in the historical toxicity tests.
21. 4.6.2 Metals Bioavailability - In this analysis, 4 of the 56 samples (7%) had a metals ESBTU exceeding 1.0, and these samples were predicted to be nontoxic according to the optimized mean PEL-Q model. The discussion indicates that 2 of the stations are located in the gunnite-lined channel portion of the Site. The discussion concludes that with the exception of the gunnite-lined portion of the Site, the optimized mean PEL-Q model is a reliable surrogate for identifying any potential toxicity due to the combined effects of copper, lead, nickel, silver, and zinc. Looking at Table 24, it appears that the other 2 incidences where the metals ESBTU exceeded 1.0 (and the optimized mean PEL-Q model would predict no toxicity) occurred at Station U. Given that the simultaneously extracted metals/ acid volatile sulfide (SEM/AVS) ratio for the April 2001 monitoring event at Station U was the second highest in the whole data set (16.7, compared with 966 for Station 7 at the same time), this uncertainty should be discussed further.
22. 4.6.4 COPCs Without SQG Values - This section evaluates the uncertainty associated with chemicals that were not included in the optimized mean PEL-Q model. In this analysis (for chemicals without SQGs), locations where the maximum detected concentration is greater than ten times the average detected concentration were identified. Of the samples where the optimized mean PEL-Q model does not predict toxicity, the discussion indicates that only one result (hexachlorobenzene at Station G) demonstrated a concentration in excess of ten times its average detected concentration. Based on this evaluation, the JDG concludes that the uncertainty associated with identifying a sample as non-toxic (but with elevated COPCs without SQGs) is considered low. We suggest that this analysis will be more meaningful if the *Leptocheirus* toxicity test results (and/or any other toxicity tests selected for the predictive sediment toxicity model) are actually compared with the COPC concentrations. We also suggest that for hexachlorobutadiene and hexachlorobenzene in particular, that this discussion

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be amended with a summary of the available toxicological information for benthos.

23. 5 Fish Risk Analysis and Characterization - The discussion should describe how pelagic versus benthic fish will be evaluated specifically.
24. 5.3.1 Exposure Assessment (Fish, Bioaccumulative COPCs) - The discussion indicates that sampling will target fish measuring less than or equal to 15 cm in length as fish larger than this size class will likely average their exposure over a range larger than the Site. We understand this concern regarding larger fish. However, we suggest that some larger fish be collected to more adequately assess the risks associated with bioaccumulative COPCs in Patrick Bayou. Migration, home range dynamics, and site fidelity can be discussed in the uncertainty analysis and in the exploratory data analysis (discussed in this section).
25. 5.3.2 Effects Assessment (Fish) - For fish, the measure of effect for this measurement endpoint will be tissue-based threshold effect concentrations. The primary source of tissue-based effects concentrations is the ERED database (U.S. COE). The discussion should reflect more information regarding the types of studies that will preferentially be used (e.g., effect class, body part, life stage, exposure route) from this data base.
26. 6.1.1.1 Contaminant Concentration in the kth Type of Food ( $C_k$ ) - The discussion indicates that the 95 UCL will be estimated using current statistical methodology and it will represent the concentration term (C) for the kth prey group for this measurement endpoint. We are assuming that the JDG proposes to calculate a 95 UCL for each prey type as an average across the bayou. For most of the proposed measurement receptors, this is probably appropriate. However, we suggest that the BERA should evaluate the appropriateness of distinct UCLs for different exposure areas for the sediment probing invertivores.
27. 6.1.1.2 Fraction of kth Type of Food that is Contaminated ( $FR_k$ ) - The discussion explains that this term represents the proportion of a specific prey item/group (k) that is contaminated in the diet of the receptor, and that in the BERA, this term will not initially be varied (i.e.,  $FR_k=1.0$ ). It is understood that this term will not be varied but the discussion leaves the door open for this. Unless we have misunderstood the application within the dose, the use of this term together with an area use factor (AUF) adjustment, appears to be an inappropriate compounded adjustment. This comment should also be applied to the discussion of the  $FR_{animal}$  and  $FR_{plant}$  terms for the raccoon (Section 6.2.4).

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28. 6.1.1.5 Proportion of Diet for Prey Groups ( $P_k$ ) - This term, according to the discussion, represents the relative proportion (from 0 to 1.0) that a specific prey group (e.g., fish) constitutes in the overall diet of the receptor. In the Appendix A calculations for the raccoon, why wasn't the prey type modeled for prey in addition to fish?
29. 6.1.2 Incidental Ingestion of Sediment - This equation and specifically the  $C_k$  term does not correspond with that used for the sandpiper and the raccoon in Appendix A. In Appendix A, rather than use a sediment concentration alone, the equation indicated modifies the  $C_k$  term with a BSAF. If we have performed the math correctly, using  $C_s$  alone raises the overall dose and suggests that several other COPCs should be retained for the sandpiper (lead, 2-methylnaphthalene, phenanthrene, and possibly hexachloroethane) and raccoon (PCB congener TEQ) that were not already indicated in Tables 13 and 14. The JDG should evaluate this aspect of the dose calculations and make any corrections that are necessary.
30. 6.1.2.1 Concentration in Sediment within Foraging Areas ( $C_k$ ) - The discussion indicates that within the defined foraging area, it is anticipated that receptors will be assumed to average their exposure (i.e., incidental ingestion) over the entire area and that estimates of exposure within a foraging area will be calculated using a surface weighted average concentration (SWAC). This sounds reasonable. How will the JDG evaluate potential hot spots within Patrick Bayou for this exposure pathway?
31. 6.2 Receptor-Specific Model Input Parameters - General and receptor-specific variable values are provided in Table 28. How does this relate to the Table 12 values? If Table 12 was used for a refined screen prior to the BERA, we suggest that the JDG provide a brief discussion that explains the conservatism of the Table 12 values related to the Table 28 values.
32. 6.2 Receptor-Specific Model Input Parameters - For each of the proposed receptors, there is a general statement that due to a lack of potential den/nest sites, the limited foraging area of the Site, and the availability of nearby habitat, it is unlikely that the Site would be selected to meet all of the habitat needs, and an AUF will be determined during the BERA. Whatever is proposed for an AUF (or site use factor), should be protective of the entire guild. The AUF discussion should also consider the likelihood of preferential foraging in and around the water bodies in and adjacent to the site. In essence, the evaluation should consider if movement outside of the Patrick Bayou corridor would be constrained by the surrounding industrial complex.

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33. 6.2 Receptor-Specific Model Input Parameters - For both the carnivorous birds and the raccoon, the text explains an approach that will be used to estimate indirect exposure to COPCs due to ingestion of contaminated terrestrial animal matter, and that the marsh rice rat will be used as a hypothetical terrestrial prey item for the purposes of estimating exposure concentrations due to animal matter. Is the intent here to model hypothetical exposure to terrestrial prey that have foraged within Patrick Bayou?
34. 6.2.1 Spotted Sandpiper - The discussion indicates that the normalized free-living metabolic rate (NFMR) term is estimated at 815 kcal/kg body weight/day. Albeit a small difference, both Table 12 and Table 28 provide a value of 820. This is also the value shown in the TDI calculations in Appendix A.
35. 6.2.2 Carnivorous Birds - Looking at Table 4-3 in the Wildlife Exposure Factors Handbook (and Table 28 in this submittal), it appears that the assumed assimilation efficiency (AE) values for fish and aquatic invertebrates have been confused for the carnivorous birds as well as the kingfisher.
36. 6.2.2 Carnivorous Birds - An incidental sediment ingestion rate of 3% will be assumed for this receptor group. The value was indicated as 1% in Table 28. TCEQ notes this assumption was not used in the "Carnivorous Wader Refined Calculations" in Appendix A. From our rough assessment, it does not appear addition of this exposure pathway would affect the COPC list (going forward to the BERA) for this receptor.
37. 6.2.4 Raccoon - The raccoon diet can include 1A invertebrates (clams, mussels, and oysters) (Zeveloff, 2002).  
  
Zeveloff, S. 2002. Raccoons. Smithsonian Institution Press.
38. 6.2.4 Raccoon - See previous comment regarding the use of a  $FR_{(animal\ or\ plant)}$  term less than 1 in combination with the use of an AUF.
39. 6.2.5 Site Use Uncertainties - This discussion states that establishment of AUFs during the BERA will be based on available site-specific information previously detailed (in this work plan?); but site-specific information may be collected during the BERA to refine the AUFs. The discussion goes on to say that an AUF work plan will be prepared and submitted to the agency representatives for approval at a later date, should the JDG implement this adaptive management approach to the further evaluation of AUFs. This is not clear. It is unclear what will be proposed for the BERA and what might necessitate an additional work plan. Our presumption is that the BERA may propose an AUF less than 1 based

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on the same information presented in this work plan, and that an AUF work plan would only be presented if the AUF values are later proposed to be lowered. Please clarify.

40. 6.3 Measures of Effect - The discussion indicates that LOAEL-based TRV values will be used as the effects value for the BERA. Depending on the decision regarding the brown pelican as a protected species that could forage at the Site, we repeat that risk calculations should be carried out using the NOAEL-based TRV where protected species could occur.
41. 6.3 Measures of Effect - A previous comment questioned the appropriateness of the incidental sediment ingestion dose calculations for the sandpiper. Depending on how this is resolved, additional avian TRVs (other than those in Table 29), may be necessary.
42. 6.3 Measures of Effect - Looking at the proposed avian TRVs for low molecular weight PAHs (Table 29), the JDG is proposing different (higher) values than those presented in the 2008 COPC amendment report (Table 4-6). Please provide a justification for the different TRV set.

Comments on the Draft Fish and Invertebrate Tissue Sampling and Analysis Plan (SAP)

1. 3.2.2 Develop Site Specific BSAFs for Modeling Future Conditions and Remedial Scenarios - The discussion indicates that tissue conditions measured from this study will be used to develop site-specific BSAFs and that BSAFs will be calculated as the ratio of COPC concentration in tissue to the concentration in sediment. Will the BSAF determination be modified by organic carbon (in sediment) or percent lipid (in fish)? The JDG should explain the approach one way or the other.
2. 3.3 Relationship to Other Activities - The discussion indicates that the human health risk assessment work plan (HHRA Work Plan) is currently under development, and that if the need to collect additional Site tissue data for fish or invertebrates should arise from the data gaps identified in the HHRA Work Plan, it is anticipated that an addendum to this SAP would be prepared to address sampling needs for the HHRA. The discussion goes on to say that this sampling would occur concurrent with activities described in this SAP (to support the BERA) in order to streamline efforts (e.g., mobilization costs, lab costs, etc.) associated with such sampling. Although concurrent sampling to support the BERA and the HHRA may be optimum, sampling may need to be at different

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times to ensure collection of fish of the size and species likely consumed by humans.

3. 3.6.2 Prey Groups (Group 2 Invertebrates) Group 2B includes higher trophic level invertebrates such as blue crab. We suggest that sampling target male blue crabs since the males tend to travel limited distances, remaining close to brackish water while females migrate to marine environments to spawn (Guillory, et al., 2001).

Guillory, V., and others. 2001. The Blue Crab Fishery of the Gulf of Mexico, United States: a Regional Management Plan. Gulf States Marine Fisheries Commission. October 2001, Number 96.

<http://www.gsmfc.org/publications/GSMFC%20Number%20096.pdf>

4. 3.6.3 Sample Locations - The discussion explains that tissue samples will be collected from 4 reaches in Patrick Bayou (e.g., Figure 3-1) and 4 or 5 stations will be targeted within each reach. The BERA work plan does not mention the proposal to divide the bayou into reaches. We are not opposed to this idea. However, the work plan should be revised to explain how data within each reach or across reaches will be integrated to model a given wildlife receptor's food dose. Also, please explain how the sample station designations within a particular reach will be integrated with the sample distance limits provided in Table 5-2.
5. 3.6.3 Sample Locations - The discussion indicates that for Group 2 Fish and Group 2A Invertebrates, sample locations will not necessarily be co-located with sediment samples, and that collection efforts will be performed on a reach-wide basis. How will this impact the determination of the BSAF for a given prey group/location?
6. 3.6.4 Number of Samples - This discussion focuses on the desired number of samples per Prey Group and concludes that the minimum number of samples to be targeted for collection within a Prey Group is set at 15. The discussion goes on to say that a minimum of 20 samples will be targeted for Prey Group 1A Fish and Group 1 Invertebrates with the maximum sample target number for each Prey Group set at 25. Please clarify what is meant by a "sample." We assume this means a single organism or a composite sample of a particular Prey Group (single fish species or invertebrate genus) type from any one designated sample location. We also assume that the number of desired samples is across the entire bayou and not per reach.

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7. 3.6.4 Number of Samples - Table 3-4 identifies the analyte classes that will be analyzed for in each Prey Group. The analytes for each prey class may need to be adjusted based on a re-analysis of the wildlife refinement calculations (particularly sediment ingestion pathways).
8. 3.7 Sampling Schedule - The discussion indicates that sampling is expected to occur over a 2-week period between May 1 and November 31, 2010 and that sampling between the months of December and April will not be performed because 1) water levels are typically low and access to areas of the Site is problematic, and 2) lipid content (which is an important reservoir for some organic contaminants) of fish and invertebrates may generally be low. During our meeting on October 27, 2010, JDG representatives indicated that field work will likely be postponed until spring 2011. We suggest that sampling be postponed until summer or early fall to ensure optimum lipid levels and to increase the likelihood of obtaining a variety of fish. Additionally we suggest that sampling not be performed closely following a significant rain event. We suggest that the JDG provide a discussion in this section that details the preferred waiting period, rain event threshold that may dictate a delay in sampling, and the preferred salinity regime. We also suggest that the water salinity and dissolved oxygen be monitored during all sampling events.
9. 5.1.2 Collection Methods - The discussion explains (page 29) that since foraging ranges for various Prey Groups are expected to differ, a sampling area will be specified for each Prey Group in order for sampling efforts targeting those Prey Groups to be considered the same "location" (Table 5-2) for the purposes of compositing samples if necessary to meet analytical tissue volume requirements. The discussion should provide a basis/reference for these sample distance limits.